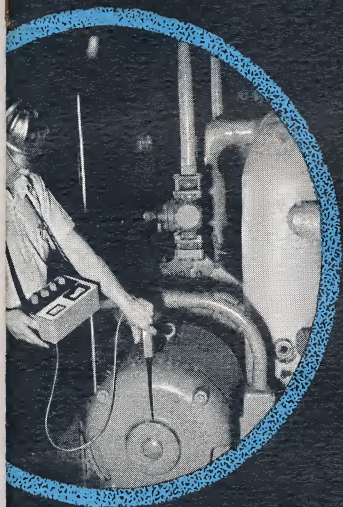


VIBRATION



- the positive KEY to machinery condition.

IRD

INTERNATIONAL RESEARCH AND DEVELOPMENT CORPORATION

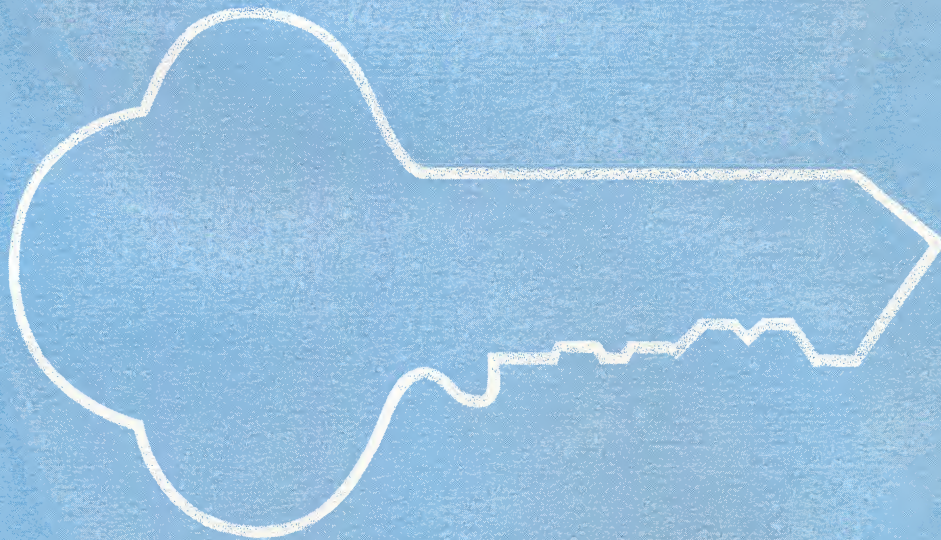
IRD serves industry with knowledge, equipment and training to reduce downtime and maintain more efficient operation of rotating machinery. This service is based on a well known fact . . . VIBRATION is the KEY to machinery condition.

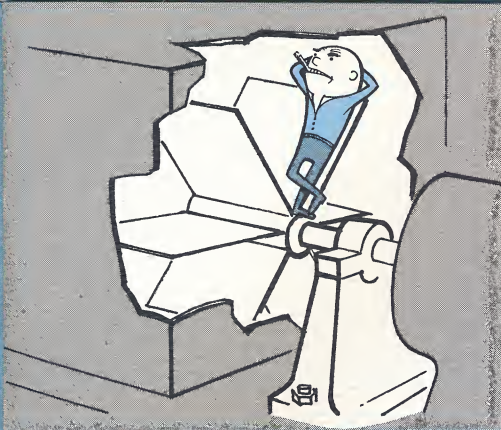
All machines vibrate.

Excessive vibration results from machinery defects.

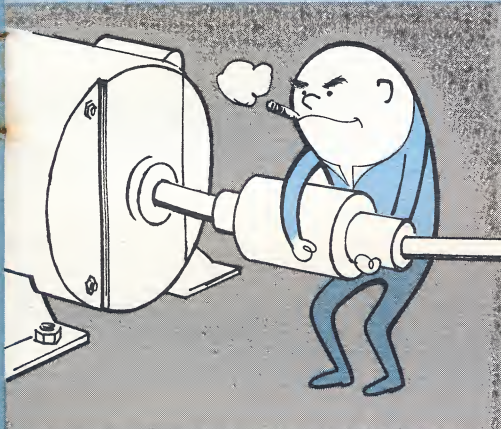
Vibration analysis reveals which part is defective.

This brochure describes how industry is using these facts to increase profits. The plant-wide application of IRD portable equipment — for a greater understanding of machinery condition — is supported by IRD's National Audio-Visual Training plus advanced schools in balancing and engineered maintenance. IRD training programs are a continuous customer service — without charge.





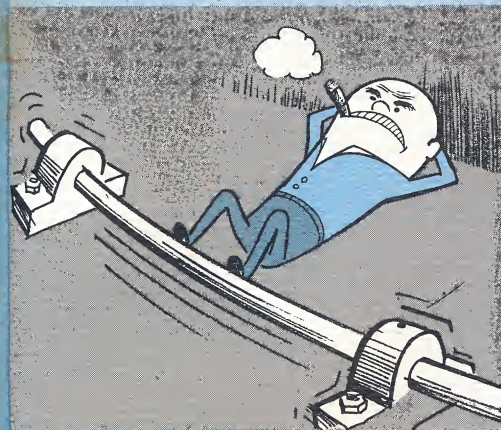
UNBALANCE — most common cause of vibration is corrected in-place, without disassembly.



MISALIGNMENT causes large axial vibration.



LOOSENESS is detected by vibration at twice the machine speed.



BENT SHAFT causes vibration similar to misalignment. Shaft vibration readings pinpoint this trouble.

Vibration is the KEY because. . .

Machinery vibration due to minor mechanical defects is normal. When the defects start to become trouble 🤖 vibration increases. Therefore, *excessive vibration means trouble 🤖 present or impending.*

Each mechanical defect causes vibration in its own way.

First, vibration frequency, number of times per minute the part vibrates, is usually the same as the part RPM or some multiple of part RPM.

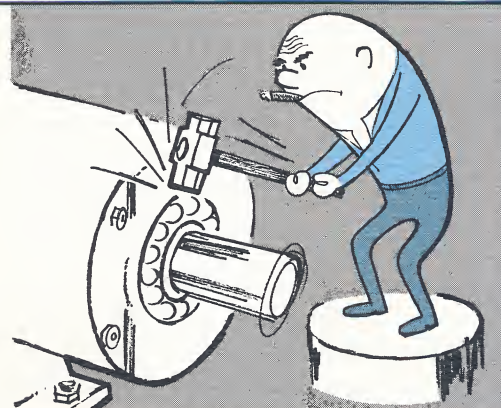
Second, the larger the vibration displacement, distance the vibrating part travels back and forth, the more serious is the mechanical trouble 🤖.

Third, vibration is often complex — that is — there are several parts causing vibration. Therefore, *vibration analysis can reveal which part of a machine has trouble 🤖 and why.*

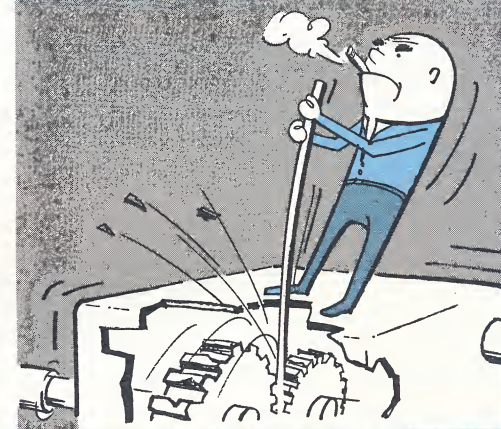
And finally, vibration standards can be established to provide positive indication whether or not repairs are required.

All of this is accomplished while a machine is operating as it normally does — without interrupting production .

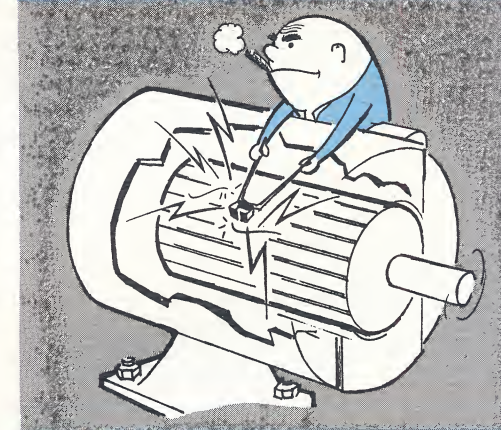
Vibration — the **KEY** to machinery condition unlocks the door to a *plan* to tell when repairs are needed — without interrupting production. Truly a sound policy to assure engineered maintenance protection against downtime losses.



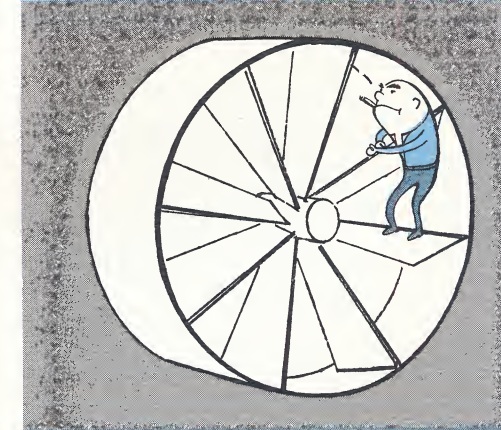
BAD ANTI-FRICTION BEARINGS result in a high frequency vibration on bearing housing.



BAD GEARS generate high frequency vibration equal to gear teeth times RPM.



ELECTRICAL trouble is determined when vibration reading disappears the instant power is turned off.



AERODYNAMIC & HYDRAULIC forces of fans and impellers cause vibration at multiples of shaft speed.

VIBRATION - the positive KEY to machinery condition.

A SOUND POLICY. . .

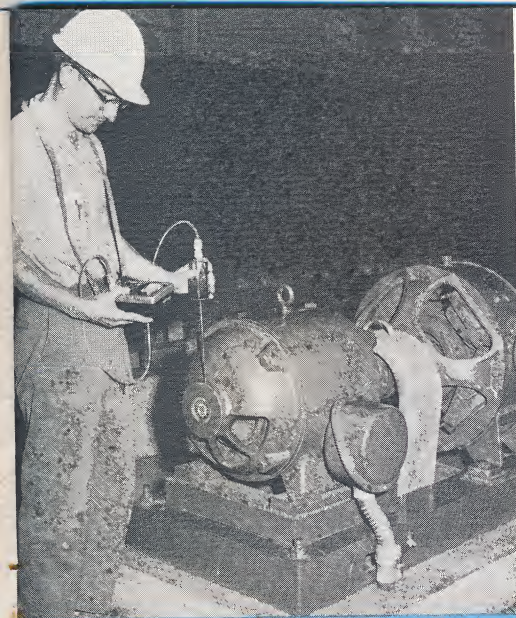
. . . to assure Engineered Maintenance Protection against downtime losses.

While preventive maintenance is not new, industry continues to seek practical ways to reduce costly downtime. To meet this demand IRD offers positive manufacturing and maintenance control through vibration measurement, analysis and dynamic balancing.

IRD Recommendations are time-tested and proven by the practical experience of many leading companies. Based on years of field experience and research, the Recommendations include a guide sheet for each type of your critical machines showing characteristics of vibration and check✓ points to be used.

Without obligation, IRD's engineering staff will prepare a Preventive Maintenance Program Recommendation — your guide to Engineered Maintenance Control.

.... continuously supported by IRD customer training - without charge.



DETECTION

HOW ENGINEERED MAINTENANCE OPERATES

3 Simple Steps

1. Detection — A periodic vibration check is the key to controlled maintenance. The single vibration check ✓ point located on each critical machine requires only a few seconds to record. Vibration at the check ✓ point gives an early warning of impending danger. Knowing machinery condition permits scheduled repairs without interrupting production.

2. Analysis — A complete vibration analysis is performed where periodic checks indicate trouble. Using an IRD Vibration Analyzer, troubles such as unbalance, misalignment, looseness and bad bearings are quickly pinpointed for scheduled correction. Maintenance men know the condition of the machine. *Guesswork is eliminated.*

3. Correction — The first two steps detect and analyze the machine's condition. This allows maintenance and/or balancing to be scheduled at a convenient time. If the trouble is unbalance, the correction normally can be done in-place without disassembly.

IRD Recommendations based on a list of your critical machines provide a guide for you to follow in setting up the mechanics of an Engineered Maintenance Control program in your plant. Guide sheets for each type machine on your list are the source of information on: vibration check ✓ points, troubles identified by vibration readings, vibration tolerances, IRD equipment requirements and special considerations.

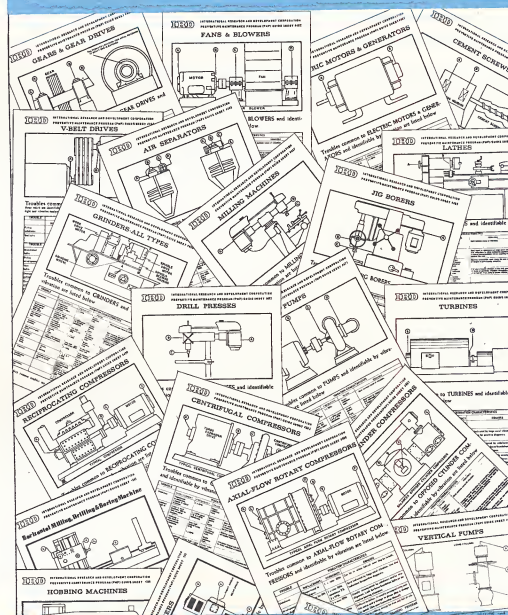
A single check ✓ point on each machine quickly provides up-to-date data on a machine's condition. Periodic checks save time, eliminate guesswork.

A data sheet (attached to the machine or carried on a clipboard) is a permanent record of machinery condition. It shows an early indication of unsatisfactory operation to guard against costly "crash" repair programs.

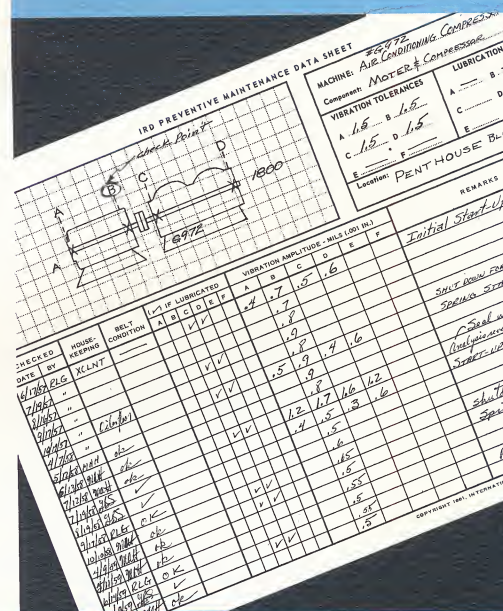
No additional manpower is needed. Your existing maintenance staff will soon expand Engineered Maintenance Control plant-wide. The know-how is provided by IRD's Audio-Visual Customer Training Program held periodically in principal cities throughout the Continental United States and Canada — without charge.



CHECK ✓ POINT



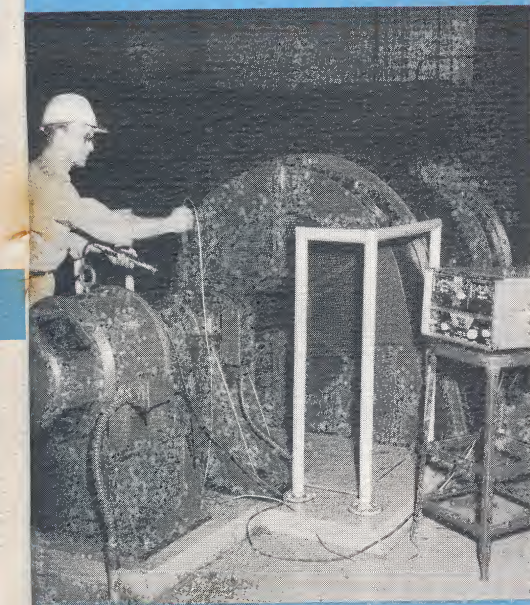
GUIDE SHEETS



PERMANENT HISTORY



ANALYSIS

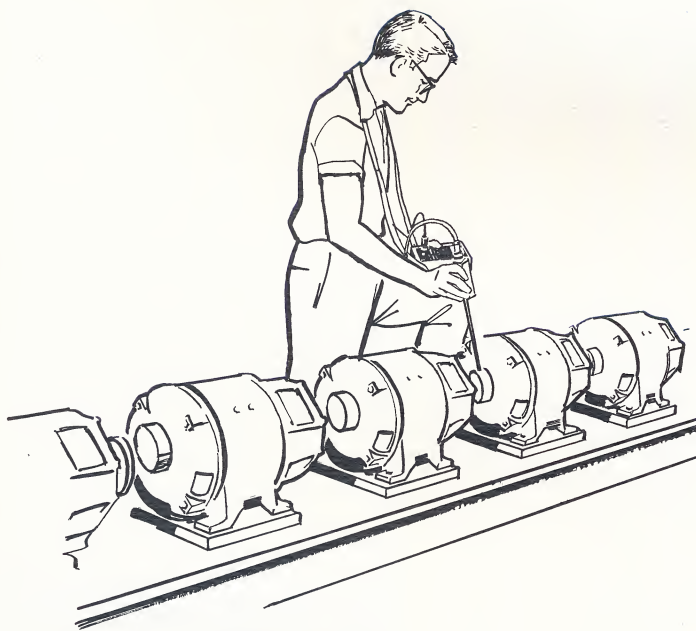


CORRECTION

VIBRATION - the positive KEY to machinery condition.

PLANT-WIDE APPLICATION

The experience and know-how developed from the use of IRD equipment on many different types of problems led to overall use for preventive maintenance. However, the fact that Vibration is the key to machinery condition is not restricted to preventive maintenance alone. IRD Recommendations suggest starting a program on an easily managed scale and allow it to expand to other areas as you gain experience and knowledge through IRD's comprehensive educational program. This concept is being used nationally as the core for plant-wide manufacturing control.

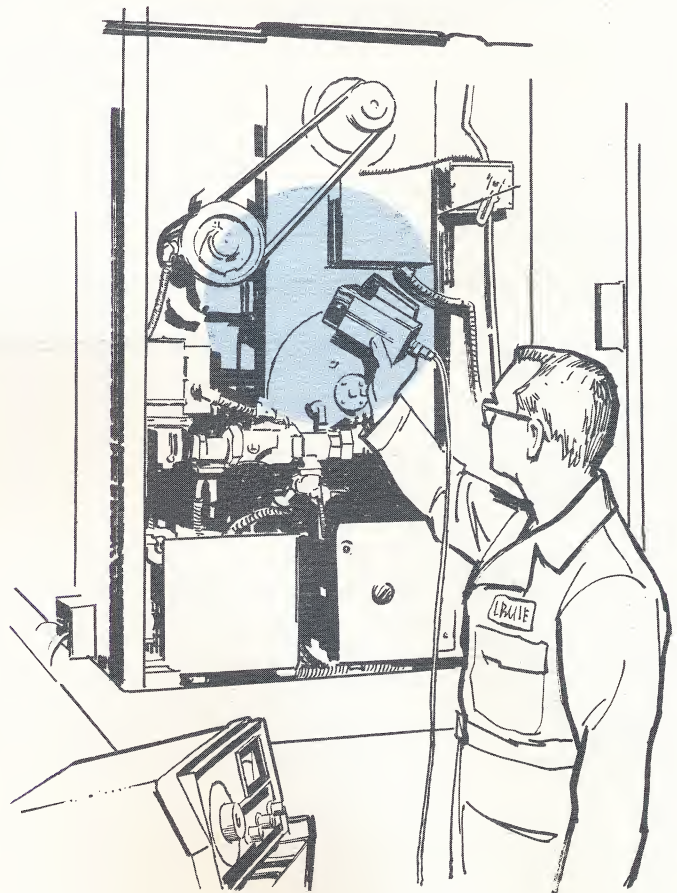


FINAL ASSEMBLY TESTING insures that your customer will receive a smooth, efficient operating machine. Reduces customer complaints and unnecessary field service calls. Vibration analysis quickly gets to the seat of trouble for prompt correction.

QUALITY CONTROL is a natural benefit of preventive maintenance, particularly on precision grinding and machining operations where vibration directly affects finish and size control. Vibration analysis and in-place grinding wheel balancing saves time and assures continued productive efficiency and quality.

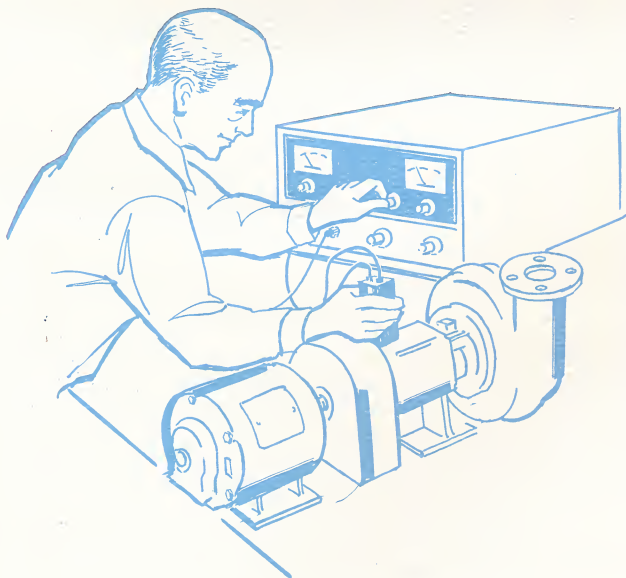
INCOMING INSPECTION of purchased components such as electric motors, gear drives and fan units prevents excess vibration in finished products — starting point of quality control and good customer relations.

SUBASSEMBLY INSPECTION of rotating units determines acceptability and helps eliminate trouble before final assembly. Chronic difficulties are quickly revealed for correction.



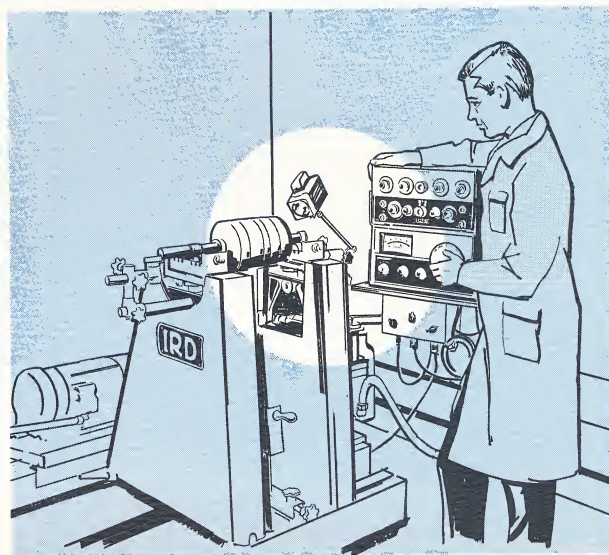
MAINTENANCE BALANCING—portable IRD instruments are used throughout industry for in-place balancing. These same instruments are equally accepted for use on a balancing stand. Many who rebuild pumps, motors, fans, turbines and spindles prefer their own IRD balancing stand to avoid the delay and expense of sending work outside the plant.

PRODUCTION BALANCING with the portable IRD Balancing Computer is fast and simple. Often used to up-date old balancing machines, the Computer provides direct readings of unbalance in easy-to-use terms for fast, positive correction.



FIELD SERVICE—The technical approach with portable IRD equipment is effective and economical. Positive installation checks assure customer satisfaction. Chronic installation difficulties are pinpointed for immediate correction. Many manufacturers profit by offering a balancing service on a fee basis.

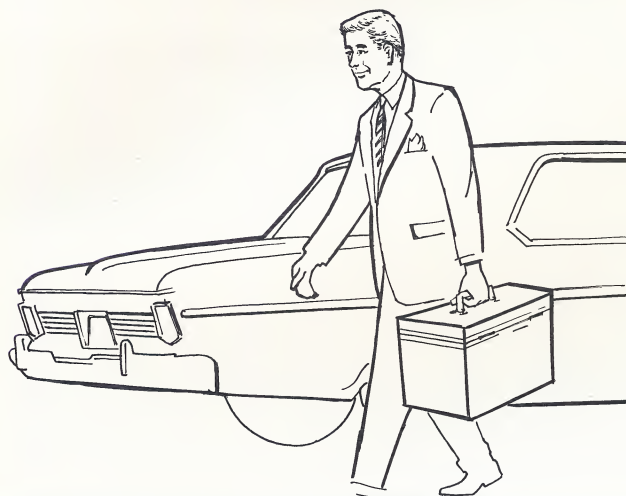
SALES—Demonstrate the quality and smooth operation of your product. Establish new standards for customers acceptance.



PLANT LAYOUT AND ENGINEERING

— Vibration in some plant areas is unavoidable. Critical machines affected by vibration from other sources can be relocated in vibration-free areas established with IRD equipment. Evaluation and acceptance of new and overhauled machinery is quickly accomplished.

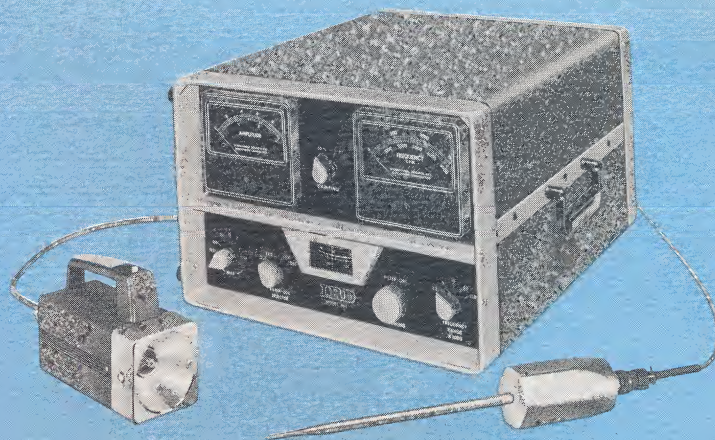
DEVELOPMENT ENGINEERING — Vibration frequently interferes with engineering tests and measurements. The ability to recognize and eliminate vibration and unbalance readily affects speed and quality of results. Studying prototype machines and manufacturing processes can eliminate problems in the early stages of development.



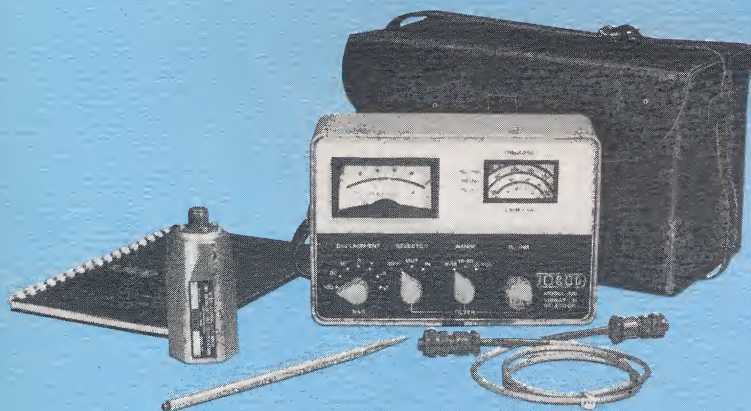
.... continuously supported by IRD customer training - without charge.



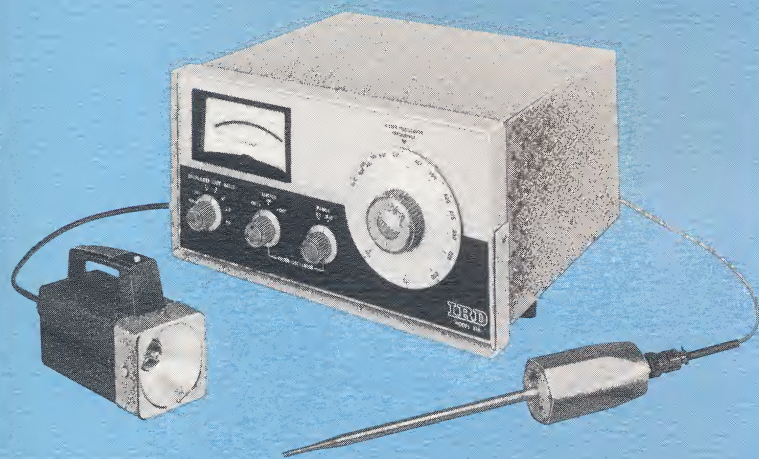
Portable Battery-Operated **VIBRATION METER** measures overall machinery vibration — to determine insurability — for periodic checks, incoming inspection, quality control, field service, sales and engineering. *Series 300.*



Portable General Purpose **VIBRATION ANALYZER** — the recognized standard for vibration analysis and dynamic balancing. Used throughout industry these versatile units quickly pinpoint machinery trouble without interrupting production. *Series 600.*



Portable Battery-Operated **VIBRATION SELECTOR** with a tunable filter measures overall vibration and selects vibration of machine components to pinpoint source of problems. *Series 320.*



Portable **VIBRATION ANALYZER** with a tunable filter and stroboscopic light is used primarily for dynamic balancing — either in-place or with a balancing stand. *Series 310.*

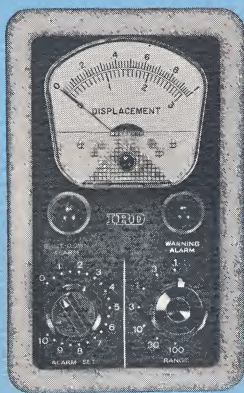
IRD EQUIPMENT

- 1ST Industrial Vibration Analyzer
- 1ST Jet Engine Vibration Analyzer
- 1ST Hot Test Stand Automotive Engine Balancer
- 1ST In-Place Balancing Computer
- 1ST to introduce **VIBRATION** as the **KEY** to machinery condition for Engineered Maintenance Control

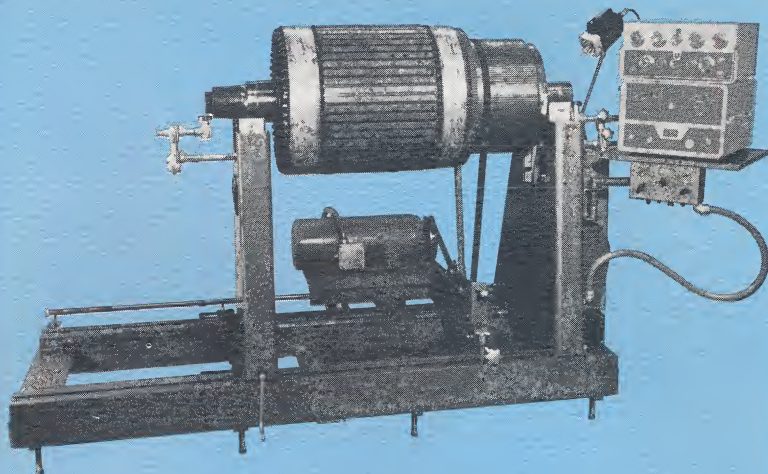
Crude by today's standards, these *firsts* represent the experience and know-how upon which today's wide acceptance of IRD equipment is based.

Each of IRD's modern instruments and machines are designed and constructed to the highest quality standards for industrial usage and years of continued service.

IRD equipment includes small portable instruments for overall vibration measurement to complete systems for vibration analysis and in-place dynamic balancing. Each includes an **IRD vibration pickup** which changes the vibration (mechanical motion of the machine) to an electrical signal. This signal, converted to a meter read-



VIBRATION MONITOR provides 24-hour protection for critical machines. These units have two separate alarm signals, one to warn of excessive vibration, and another to signal a danger point or machine shutdown. *Series 1200.*



BALANCING STANDS feature fast set-up for a wide variety of workpieces. Portable IRD Vibration Analyzers serve as the balancing instrument for maximum flexibility. *Series 100.*

ing, shows **how much** vibration is present. Excessive vibration indicates trouble present or impending.

In some machines vibration is complex. With a **tunable filter** individual vibrations can be selected much as a radio is "tuned" to individual stations. This permits determining the nature of the trouble just as a radio speaks its distinctive message for each station.

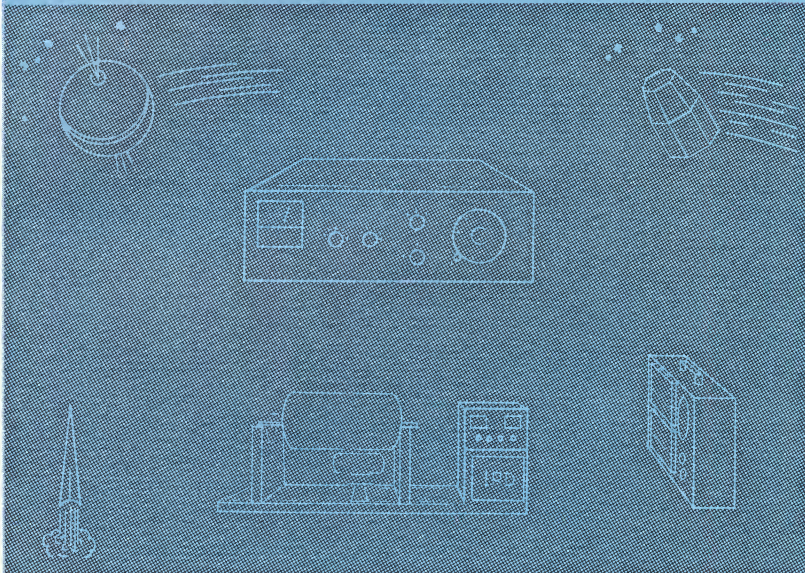
Using a **stroboscopic light** which flashes on and off in time with the vibration, parts are "frozen" or made to appear to stand still, visually pinpointing the trouble. When unbalance is the trouble the "strob" light is used to indicate the position of the unbalance.

Continuous protection for critical machines is provided by vibration monitoring. When vibration exceeds a preset limit relays operate a warning system and/or shutdown a machine.

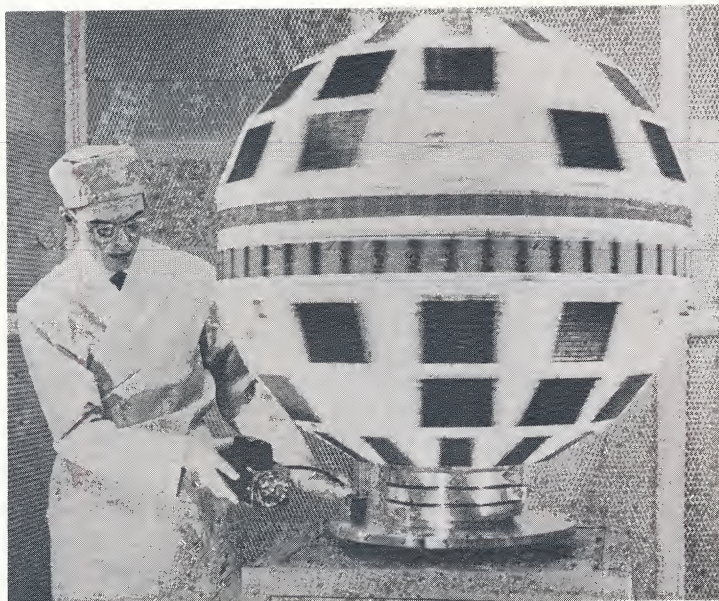
IRD leads the field by combining years of experience, the latest equipment, 3 comprehensive training schools and your knowledge of machines to provide Engineered Maintenance protection.



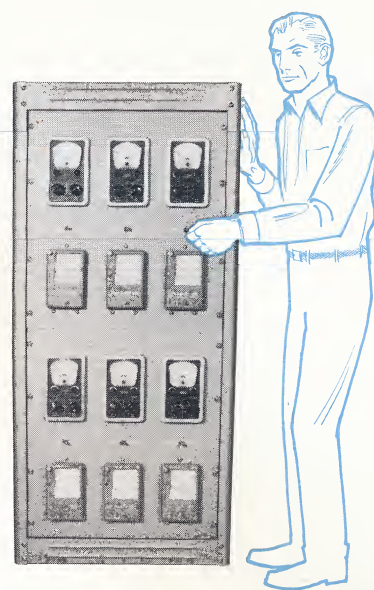
BALANCING COMPUTER simplifies and speeds balancing, in-place or with a Balancing Stand. By providing unbalance readings, amount and position, in actual terms of correction, production balancing is done in a single start-stop operation. *Series 200.*



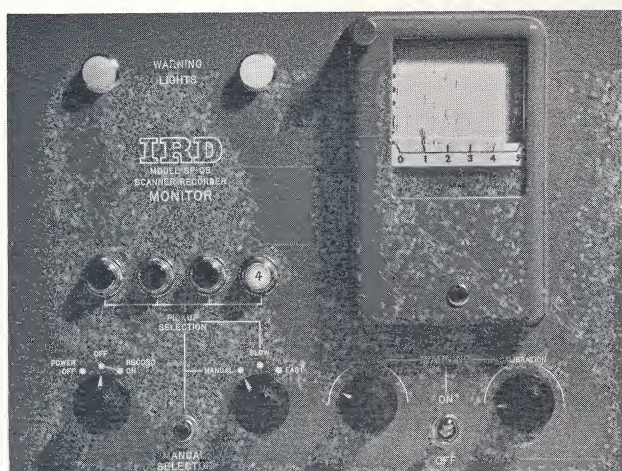
IRD research and training facilities are dedicated to industry's growing needs.



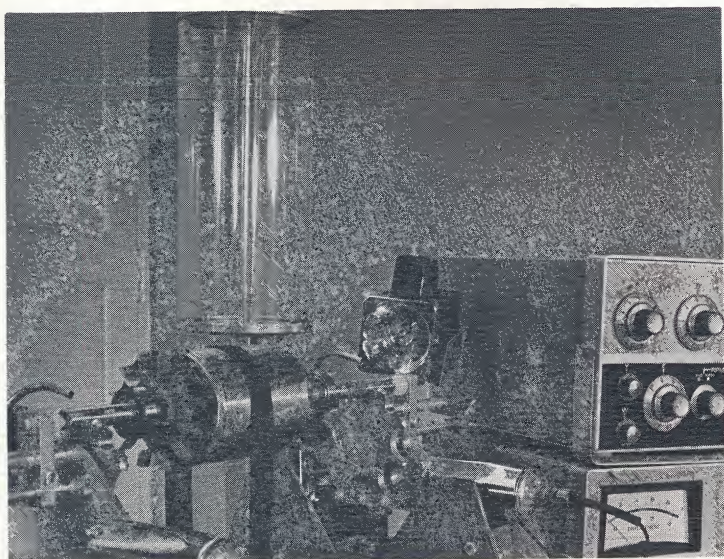
Telstar Balancing



6—Channel Monitor—Recorder



**4—Channel Monitor—Recorder
with Automatic Switching**



Production Armature Balancing

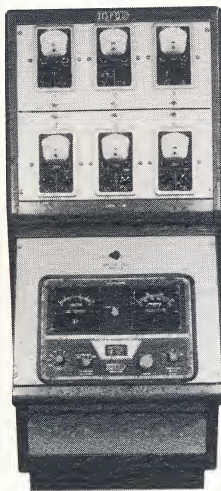
NATIONAL CONSULTING SERVICE

IRD's National Consulting Service provides immediate assistance in solving vibration and balancing problems. An IRD service engineer visits your plant . . . analyzes the vibration in your machinery . . . determines the nature of the trouble . . . recommends corrective measures . . . and performs any necessary dynamic balancing in-place. A complete written report of the work done is included.

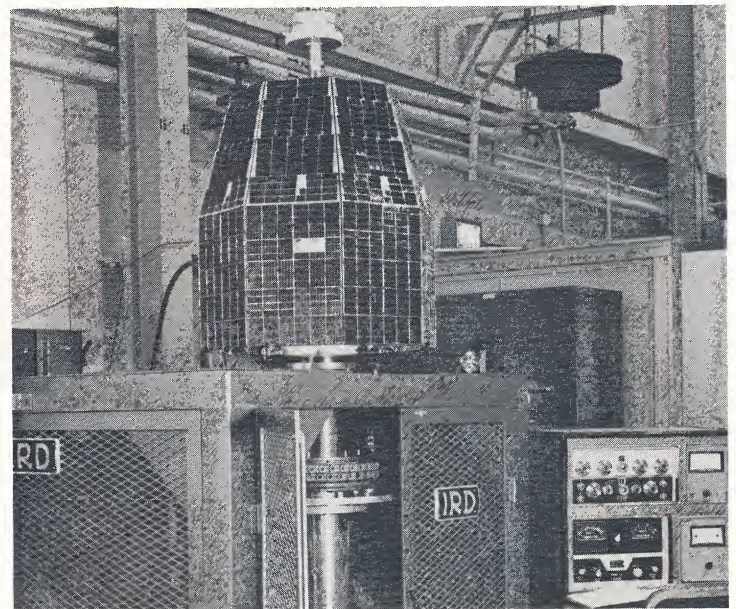
Available by the day or on a contract basis this service provides valuable assistance in solving vibration and balancing problems. It is often the start of a plant-wide Engineered Maintenance Control program.

IRD's staff is also available to investigate your requirements for special equipment. Many unique systems have resulted from this design service.





6—Channel Monitor—Analyzer



Relay Balancing

SPECIAL SYSTEMS

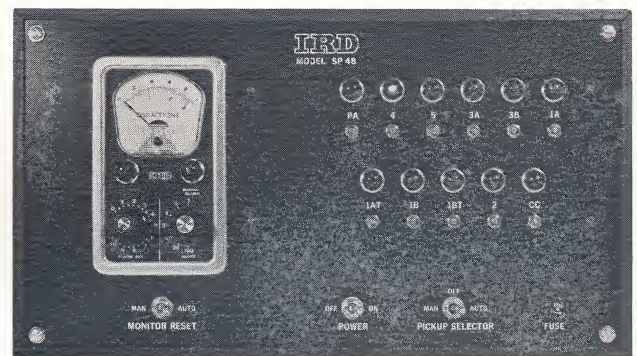
Standard IRD equipment serves as the nucleus for special systems designed to meet specific requirements from balancing stands for satellites to complete vibration monitoring systems.

Vanguard, the first U. S. satellite in orbit, was balanced using IRD equipment. Telstar, Relay, Tiros, and others have been balanced using standard IRD equipment with a specially designed system to meet each customer's requirement.

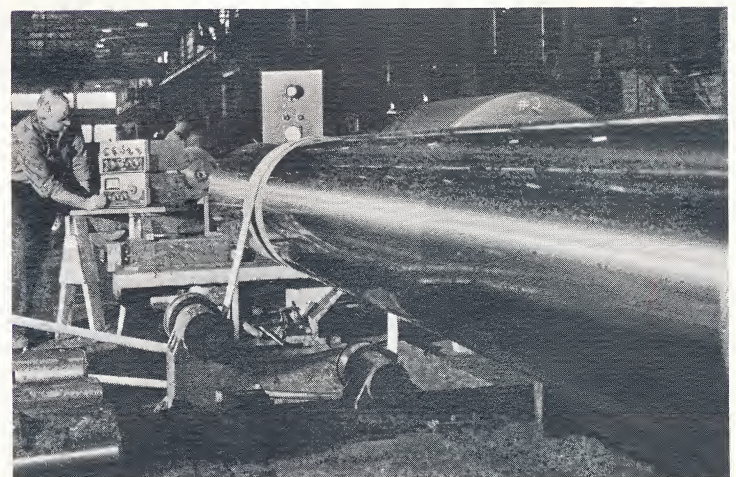
Critical machines often require vibration monitoring to provide continuous 24-hour protection. Special monitoring systems have been provided with recording, built-in vibration analyzer, non-contacting shaft displacement pickups, automatic switching, start-up protection, and special filtering. Each system uses standard IRD instrumentation where possible for maximum economy and reliability.

There are many other areas such as final assembly testing and production balancing which also require special attention to specific needs. IRD's engineering staff will combine ingenuity and years of experience on a wide variety of problems to provide the system to meet your requirements.

Whatever your interest — vibration measurement, analysis, monitoring or balancing — call or write IRD.



11—Channel Monitor
with Automatic Switching



Large Roll Balancing

Partial List of

IRD EQUIPMENT USERS

Aircraft Manufacturers
Aero Design & Engrg. Co.
Beech Aircraft Corp.
Boeing Airplane Co.
Cessna Aircraft Co.
Hughes Aircraft Co.
Kaman Aircraft Co.
Lockheed Aircraft Corp.
North American Aviation
Piasecki Helicopter Corp.
Vertol Aircraft Corp.

Automotive Manufacturers
American Motors
Caterpillar Tractor Co.
Chrysler Corp.
Cummins Engine Co., Inc.
Ford Motor Co.
General Motors
International Harvester Co.
Letourneau-Westinghouse
Seagrave Corp.
White Motor Co.

Bearing Manufacturers
Aetna Ball
Fafnir Bearing Co.
Miniature Precision Bearings
New Hampshire Ball Bearings
Norma Hoffman Bearing Co.
Rollway Bearing Co., Inc.
SKF Industries, Inc.
Timken Roller Bearing Co.
The Torrington Co.
Tyson Bearing Corp.

Business Machines & Computers
Bendix Corp.
Bryant Computer Products
Dictaphone Corp.
General Electric
IBM Corp.
Monroe Calculating Machine Co.
National Cash Register Co.
RCA
Sperry Rand Univac Div.
Xerox Inc.

Cement Producers
Coplay Cement Mfg. Co.
Diamond Alkali Co.
Hercules Cement Co.
Huron Portland Cement Co.
Marble Cliff Quarries Co.
Missouri Portland Cement Co.
South Dakota Cement Co.
Southwestern Portland Cement Co.
Universal Atlas Cement Co.
Whitehall Cement Mfg. Co.

Chemical Producers
Allied Chemical Corp.
Chemstrand Corp.
Dixon Chemical Inc.
Dow Chemical Co.
E. I. duPont de Nemours & Co., Inc.
Escambia Chemical Corp.
Jefferson Chemical Co.
Monsanto Co.
Olin Mathieson Chemical Corp.
Wyandotte Chemical Co.

Education & Research Institutes
Armour Research Foundation
Battelle Memorial Institute

Princeton University
Purdue University
University of California
University of Hawaii
University of Massachusetts
University of Minnesota
University of Tennessee
University of Wichita

Electrical Machinery Manufacturers
Allis-Chalmers Mfg. Co.
Electric Machinery Mfg. Co.
Electro-Dynamic Div.
Fairbanks Morse & Co.
General Electric Co.
Louis Allis Co.
National Electric Coil Div.
Reliance Electric & Engineering Co.
Wagner Electric Corp.
Westinghouse Electric Corp.

Electric Motor Repair
Berthold Electric Co.
Economy Electric Co.
Electric Repair Service Co.
General Electric Co.
Hannon Electric Co.
Jackson Bayley Electric Co. Inc.
Mid-Ohio Electric Co.
Motor Coil Mfg. Co.
National Electric Coil Co.
Sangamo Electric Co.

Fan & Blower Manufacturers
American Blower Corp.
Bayley Blower Co.
Buffalo Forge Co.
Clarage Fan Co.
Fly Ash Arrestor Corp.
Hunter Fan & Ventilating Co.
Joy Manufacturing Co.
Lennox Industries, Inc.
Morrison Products Inc.
H. H. Robertson Co.

Industrial Insurance Co.
Fidelity Casualty Co.
Hartford Steam Boiler Insp. & Ins. Co.
Lumberman's Mutual Insurance Co.
Mutual Boiler & Machinery Ins. Co.
Travelers Insurance Co.

Machinery Manufacturers
Amana Refrigeration Inc.
American Brake Shoe Co.
Barber Coleman Co.
Beloit Iron Works
Borg Warner Corp.
Farrel Birmingham
Food Machinery & Chemical Corp.
Foster Wheeler Corp.
Harnischfeger Corp.
Jeffrey Mfg. Co.

Machine Tool Manufacturers
Bryant Chucking Grinder Co.
Cincinnati Milling Machine Co.
Excellco Corp.
Hardinge Bros. Inc.
R. K. LeBlond Machine Tool Co.
Lodge & Shipley Co.
Morse Twist Drill
New Britain Machine Co.
Sheffield Corp.
Warner Swasey Co.

Municipalities
Chicago, Illinois
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
El Segundo, Calif.
Gainesville, Fla.
Jacksonville, Fla.
Los Angeles, Calif.
Orlando, Fla.
Worcester County, Mass.

Paper Manufacturers
Champion Paper Co.
Crossett Paper Mills
Great Northern Paper Co.
Gulf States Paper Corp.
International Paper Co.
Kimberly Clark Corp.
St. Croix Paper Co.
St. Regis Paper Co.
Union Bag Camp Paper Corp.
West Virginia Pulp & Paper Corp.

Petroleum Refiners
Atlantic Refining Co.
California Oil Co.
Esso Standard Oil Co.
Gulf Oil Corp.
Humble Oil Refining Co.
Phillips Petroleum Co.
Sinclair Refining Co.
Socony Mobile Oil Co.
Standard Oil of Texas
The Texas Co.

Pharmaceutical Manufacturers
Abbott Laboratories
Eli Lilly Co.
Miles Laboratories, Inc.
Smith, Kline & French Laboratories
Upjohn Co.

Power Generating Companies
Commonwealth Edison
Consolidated Edison Co.
Florida Power & Light
Hawaiian Electric Co.
Jersey Central Power & Light
McGraw Edison Co.
Ohio Edison
Pacific Gas & Electric
Public Service Co. of Indiana
Tennessee Valley Authority

Primary Metals Producers
Aluminum Co. of America
Brush Beryllium
Chase Brass & Copper Co.
Cleveland Cliffs Iron Co.
Erie Mining Co.
Kennecott Copper Corp.
Mountaineer Coal Co.
Reserve Mining Co.
Reynolds Metals Co.
U. S. Smelting & Mining Co.

Pump Manufacturers
Aurora Pump Div.
Barrett-Haentjens Pump Co.
Buffalo Forge Co.
Byron-Jackson Pumps, Inc.
Foster Wheeler
Pacific Pumps Inc.
Peerless Pump Hydrodynamics Div.

Warren Pumps Inc.
Weinman Pump Mfg. Co.
Worthington Corp.

Rubber Companies
Armstrong Cork & Rubber Co.
B. F. Goodrich Co.
Dayton Rubber Co.
Firestone Synthetic Rubber & Latex Co.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Raybestos-Manhattan Inc.
U. S. Rubber Co.

Space & Missile Companies
Avco Mfg. Corp.
Bell Laboratories
Boeing
Chrysler Corp.
NASA
North American Aviation
RCA Defense Electronics Div.
Tenney Engineering Inc.
USAF Special Weapon Center

Steel Manufacturers
Allegheny Ludlum Steel Corp.
Armco Steel Corp.
Bethlehem Steel Corp.
Crucible Steel Co. of America
Great Lakes Steel Corp.
Jones & Laughlin Steel Corp.
Northwestern Steel & Wire Co.
Republic Steel Corp.
United States Steel
Youngstown Sheet & Tube Co.

Textile Mills & Machy. Manufacturers
Cannon Mills
Curtiss-Wright Corp.
Farrel Corp.
Greenwood Mills
Kidde Textile Machinery Corp.
Meadows Mill Co.
Roberts Co.
Saco Lowell Shops
Stowe Woodward Inc.
Whitin Machine Works

Turbine & Compressor Manufacturers
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Carrier Corp.
Clark Bros. Co.
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General Electric Co.
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Worthington Corp.

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Army
Atomic Energy Commission
Coast Guard
Federal Aviation Agency
General Services Administration
Dept. of Interior
Marines
Navy
National Institutes of Health

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INTERNATIONAL RESEARCH AND DEVELOPMENT CORPORATION

Subsidiary of H. H. Robertson Co.

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INFORMATION REQUEST

(PLEASE PRINT OR TYPE)

To: IRD Corp.

Your letter has been received in response to our request for:

The following additional information is requested:

- ☐ Quotation on _____
- ☐ Descriptive Specifications on _____
- ☐ National Consulting Service _____
- ☐ IRD Training Programs _____
- ☐ Personal visit by an IRD Representative _____
- ☐ Other _____

Specific interest or application _____

Name _____ Title _____

Company _____ Address _____

City _____ State _____

Date _____ Signed _____

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